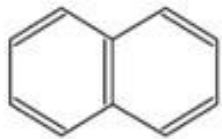


# **Bioremediation of Carbon Soot**

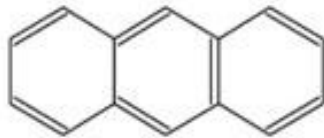
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By Karim Mohamed and Mashael Al-Naemi

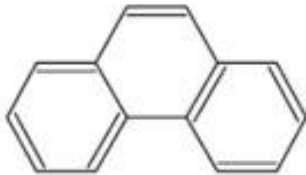
# *What is Soot?*



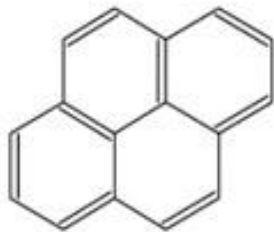
Naphthalene



Anthracene



Phenanthrene



Pyrene



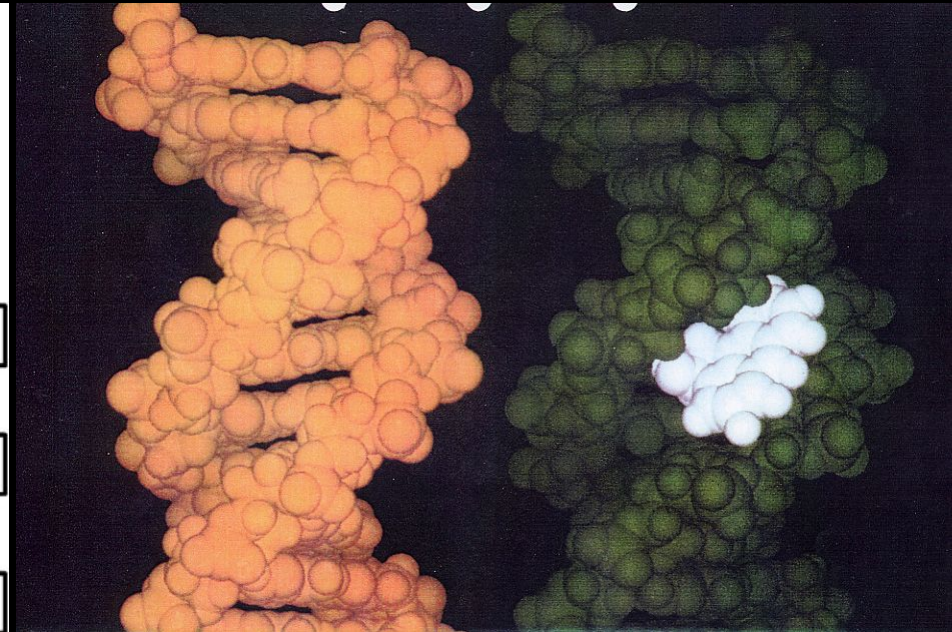
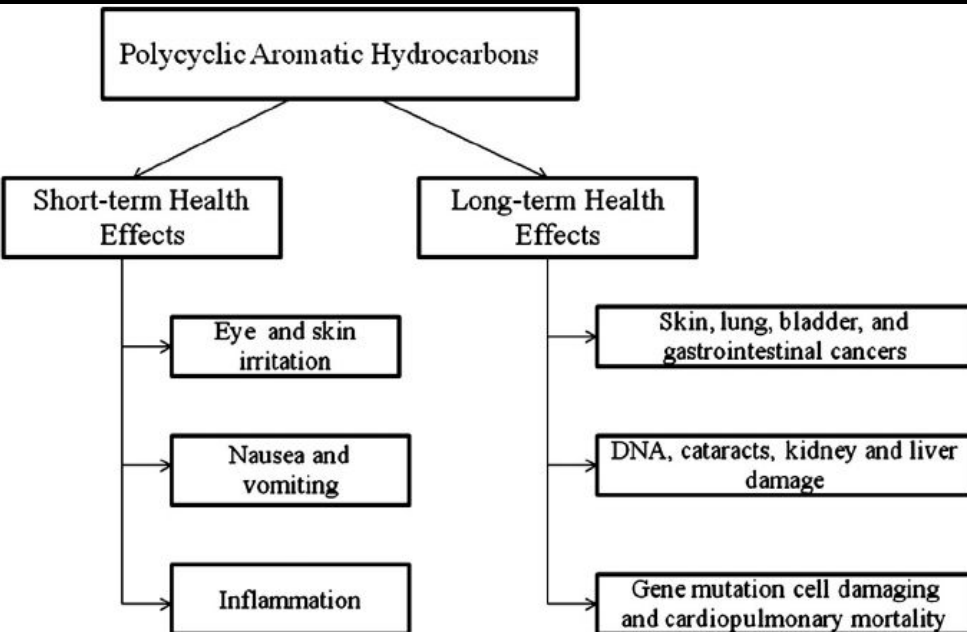
# Sources of PAHs



Incomplete combustion:

1. Automobiles, railways, ships, aircraft
  2. Coal plants, oil refineries, mining, metalworking, electrical industry.
  3. Tobacco smoke
-

# The Effects of PAHs



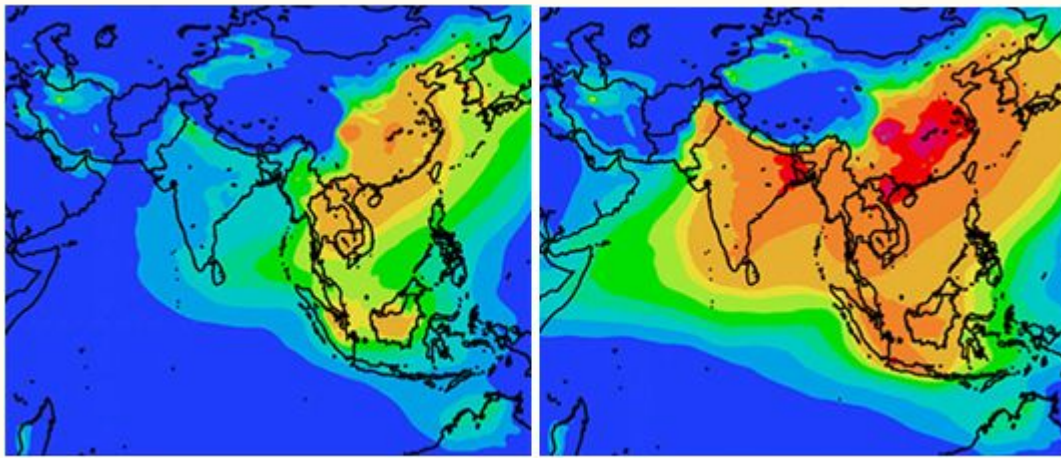
Normal DNA (LEFT), DNA with soot - white patch (RIGHT)



# Prevalence of PAHs

Polycyclic Aromatic Hydrocarbons (PAH)  
Maximum Concentration & Flux (Kurek et al., 2013)

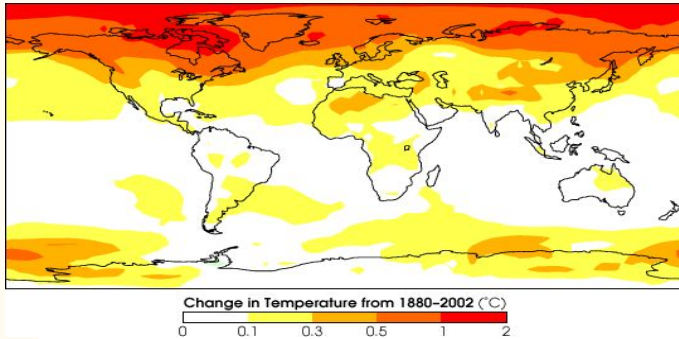




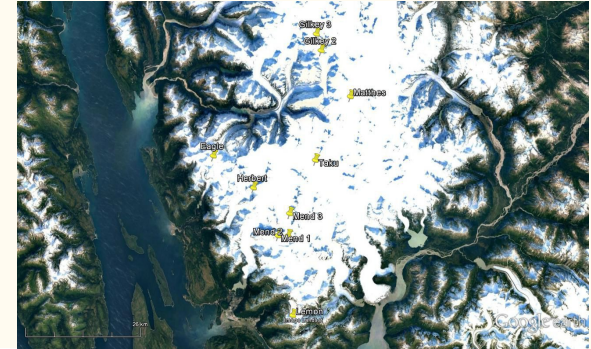
Asia; 2004 (left) and 2005 (right) comparison on soot in the atmosphere from greenhouses and kitchens alone.



Sonia Nagorski, a UAS assistant professor of geology who helped with the sampling on the Juneau Icefield in Iceland, said – despite their very small size – black carbon particles (soot) can retain additional solar energy as they settle on the snow and ice, and accelerate melting of glaciers.



Nasa claim that more than 25 percent of the increase in average global temperature between 1880 and 2002 may be due to soot contamination of snow and ice worldwide.



How common is soot in the world?

# Our solution



PAH receptor

Polycyclic  
Aromatic  
Hydrocarbon

mnP promoter

RBS

MnP

Terminating

Lac promoter

RBS

Lac

Terminating

PAH

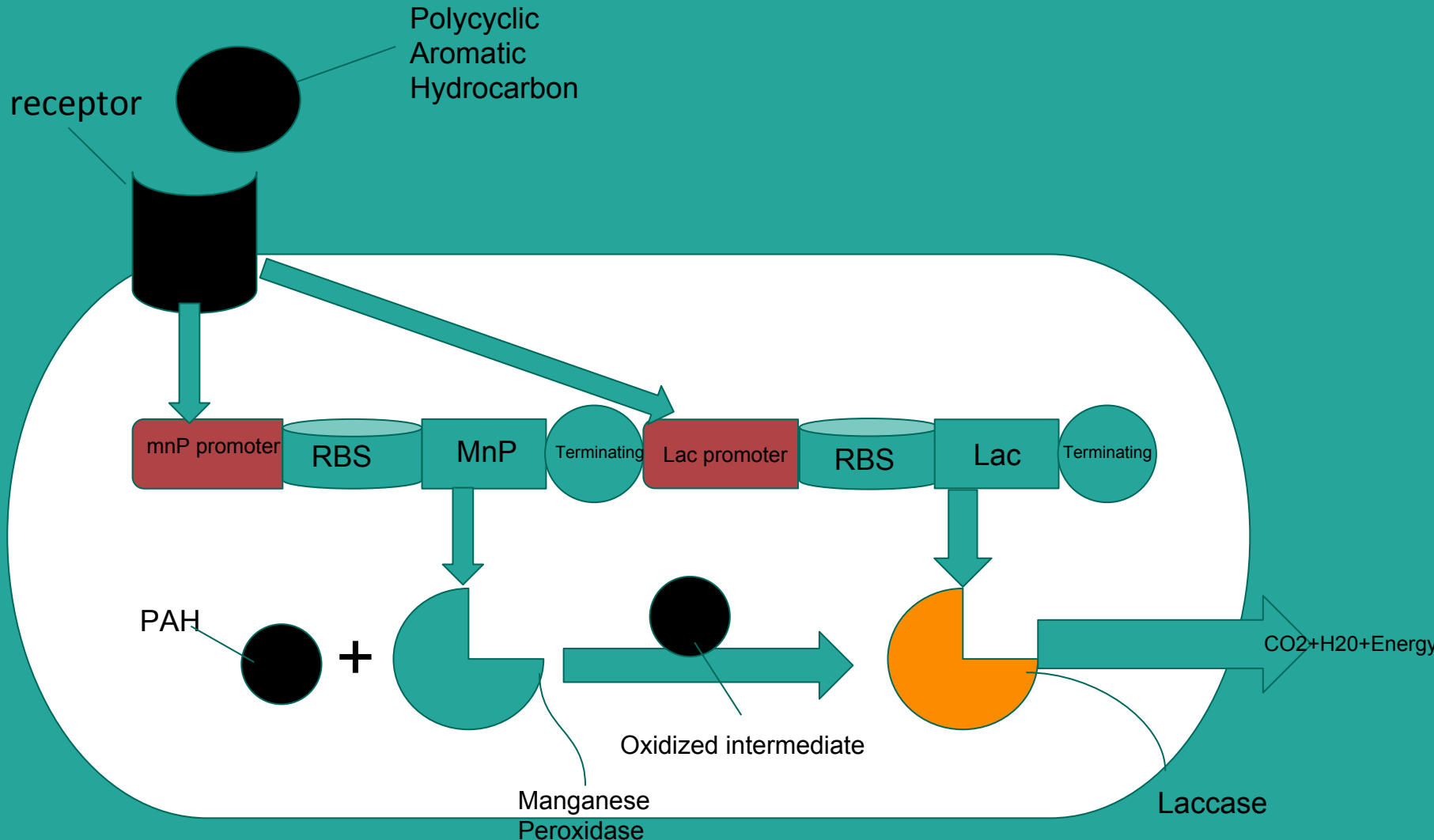
+

Oxidized intermediate

Manganese  
Peroxidase

Laccase

CO<sub>2</sub>+H<sub>2</sub>O+Energy

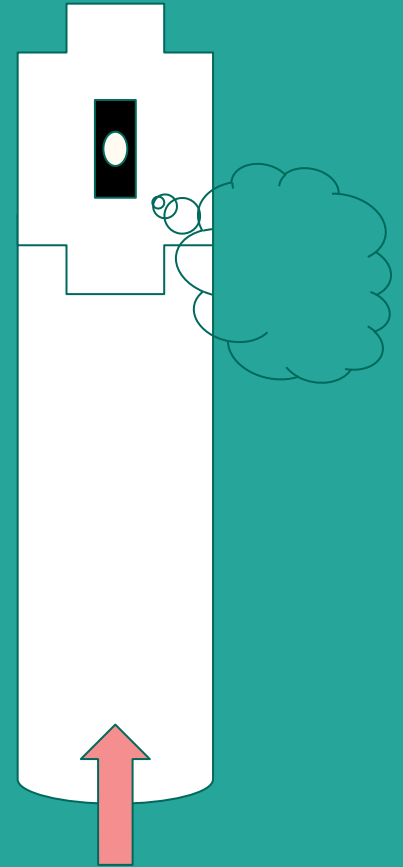




Benzo(a) pyrene	Benzo(k) fluoranthene	Production of PAH metabolizing enzymes
0	0	0
0	1	1
1	0	1
1	1	1

## Characteristics of the spray bottle:

- ❖ Sleek, modern aesthetics
- ❖ Easy to use
- ❖ Large size so it doesn't run out too quickly
- ❖ Disperses bacteria evenly
- ❖ Recyclable
- ❖ Large nozzle to provide adequate space for bacteria to freely flow



Bacterial growth medium and genetically engineered *S. acidocaldarius*.

# Design considerations

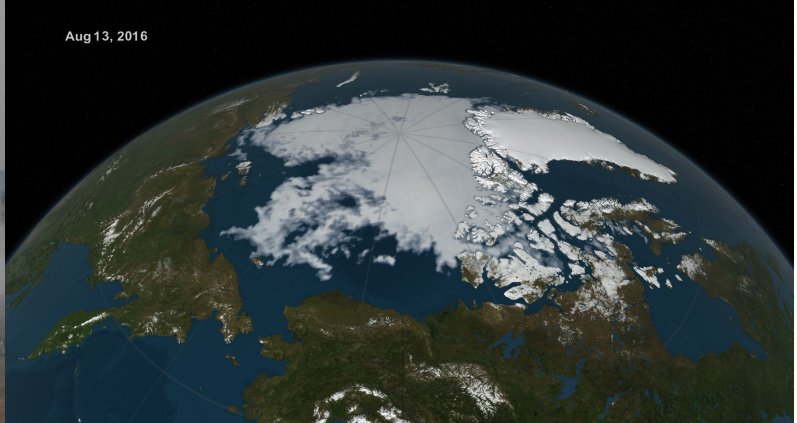
**Variables that benefit the removal of soot...**

- ❖ **Enzymes in the GMO; Versatile peroxidase, mn-peroxidase and laccase from P.Chrysosporium**
- ❖ **Enzymes involved in breakdown lack the typical substrate specificity, therefore break down many kinds of PAHs**

**Variables that have negative effects on the outcome...**

- ❖ **Reduce energy sources for other PAH metabolising organisms**
- ❖ **Accumulation of CO<sub>2</sub> from breakdown of PAHs in the atmosphere**

# Conclusion



# Citations

Sourced by NoodleTools

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